

KYASANUR FOREST DISEASE AND THE BIRD MIGRATION STUDY OF THE BOMBAY NATURAL HISTORY SOCIETY

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In the mid 1950s a new disease was reported in the Kyasanur Forest area of Karnataka State, causing high fever and other symptoms among infected persons. In addition, there were reports of dead monkeys found in the forest. These reports set off an alarm reaction from Public Health authorities.

Monkey deaths in the forests of Africa often preface an outbreak of Yellow Fever. There is no Yellow fever in India but we have all the ingredients necessary for it to flourish. The insect vector, the *Aedes aegypti* mosquito is common; climatic and environmental conditions similar to those in Central Africa are found in many parts of India. Yet we have not had any outbreaks. There is a possibility that we have some factor or factors which inhibit the spread of Yellow Fever Virus, but until such factor or factors are recognized it behoves the Indian health authorities to be always on guard.

Accordingly, the Virus Research Centre in Pune, specialized in insect or arthropod borne virus diseases, was asked to investigate the outbreak.

It was soon established that this was not Yellow Fever, but was caused by a hitherto unknown virus which was named Kyasanur Forest Disease Virus. This KFD virus was found to be closely allied to the virus of Russian Spring Summer Encephalitis (RSSE) which occurs in Siberia and regions around Lake Baikal. Every year thousands of birds from arctic and subarctic regions migrate south to winter in warmer areas where food and shelter are available. Many of those from Siberian regions come and winter in India. Could it be that migrating birds carried the virus from Siberia to India?

To resolve this question the World Health Organisation planned a study of migratory birds coming to India, and of their insect parasites, if any, which could transmit the disease to new hosts.

Sálim Ali, the leading ornithologist of India,

who had been interested in the migration of birds, was requested to undertake the study for the WHO, and the Virus Research Centre was entrusted with the study of insect parasites and viruses, if any, carried by them. A five year study was planned and a grant for this was made to the BNHS with Sálim Ali as chief investigator. A series of trapping stations were set up at various places favoured by migrating birds. The birds were trapped in mist nets, carefully removed, identified and measured. Insects attached to them were removed by combing. These were appropriately labelled and carried to the Virus Research Centre for further study and detection of viruses. The birds were then tagged with a lightweight aluminium ring bearing an identifying number (entered against the bird's details in the record), and was then released.

The BNHS exercised its usual care and economy for these studies so that when the five year period ended there was enough money left to continue for a further three years. The WHO meanwhile had lost interest. Since no virus infected birds or insects were found among the thousands trapped every year it was concluded that if at all such transfer of infection occurred, it must be a rare and aberrant phenomenon, not justifying the effort of continuous monitoring. The Virus Research Centre also, having identified the new virus and established that it was transmitted by a tick usually found in the forest undergrowth, which in turn infected animals in the forest and sometimes humans, lost interest in migrating birds. The rest of the study was therefore confined to the study of bird migration.

RESULTS

Migration: About 1,50,000 birds of various species were trapped and studied during this period. The routes taken by different species could be studied. Most of them travelled either by the Eastern route via Assam, Bangladesh and down the East

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Coast or by the Western route over Afghanistan, Pakistan, Saurashtra and the West Coast. During winter there was a large conglomeration of all these birds in and around several water bodies in South India and Sri Lanka where enough food and roosting place was available. Information was obtained on the migrating routes of different species. Recovery of a ringed bird or of its ring from distant places gave further confirmation, and in some instances gave an indication of the life span of the bird. The food sources and preferred roosting places, the associated climatic and environmental conditions were all recorded and a large amount of data accumulated for future analysis and study.

The initial camps were supervised by Sálím Ali himself, with the assistance of the BNHS staff. As work expanded and more camps were set up, some of these were run by the now well trained staff. Several research workers and interested volunteers also joined the camps. In this process, the assistants learned not only the techniques of bird trapping and banding, but also received a thorough grounding in the techniques of careful and meticulous field research. Some of Sálím Ali's early assistants have gone on to become leaders in natural history field research within the country. Reports on these studies have been published in the Journal of the BNHS.

The virus problem: The virus of KFD was identified and found to be similar but not identical with that of RSSE. The trapped birds did not show the presence of infection, and when tested for evidence of past infection, as shown by antibodies in the blood, the results were negative or equivocal. Reports of their findings are given in the published papers and the annual reports of the Virus Research Centre (now renamed the National Institute of Virology), Pune.

DISCUSSION

The question of the origin of KFD virus remains. Two facts should be considered.

1. A Serological survey conducted all over India revealed a few samples from mature human individuals in an area of Saurashtra having antibodies to RSSE/KFD for which there appeared no explanation.

2. The insect vector for RSSE is a mite, whereas for KFD the vector is a tick.

It may be postulated that at some time in the past a bird or birds infected with RSSE landed in Saurashtra and shed infected mites, which in turn infected some humans in the adjoining village. The mites died out, unable to develop in the new surroundings, leaving as their only trace a few humans with antibodies to the disease.

What has happened once can happen again, the new scene being the Kyasanur Forest area. Here, though the mites died, the infection was taken up by ticks, possibly through the blood of an infected bird which lay dying on the forest floor. An arthropod borne virus is suited to one species of tick through which it is transmitted. If it enters the body of another species it either dies out or it undergoes some change or modification which enables it to propagate itself within the body of the new host. It may be assumed that the virus of RSSE entering the body of the tick underwent such a modification to form the closely allied virus of KFD. All this is speculation, but it appears to be the most plausible explanation which can fit the facts.

It is unfortunate that this sequence of events resulted in a new disease. At the same time, it is exciting to realize that we are privileged spectators of a small facet of the process of adaptation and natural selection which forms the basis of evolution of life on the earth.